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PROCESS FOR DIRECT PRODUCTION OF GUM BASE FOR CHEWING PASTE AND CHEWING GUM [Procédé de fabrication directe de gomme de base pour pâte masticatoire et de chewing-gum]

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[54] Title: PROCESS FOR DIRECT PRODUCTION OF GUM BASE FOR CHEWING PASTE AND CHEWING GUM

ABSTRACT

To produce a gum base, at least one elastomer (a) and at least one mineral filler (b) are placed in a mixer (A); the filler is heated at 80-100°C and mixed for 15-75 minutes; the premix (c) is discharged and divided into fragments (*d*), which are introduced into a powder mixer (B) with at least one other raw material (e); after mixing for several minutes, mixture (*f*) is extracted. To produce a chewing paste of the chewing gum type, introduce into an extruder (C) having several segments, each of which can be maintained at a desired temperature, metered amounts of fragments (*d*) of the premix (c), at least one plasticizer (g,h) and at least one flavoring agent (j,k), the passage through the extruder being accomplished within several minutes, and the product obtained being then discharged from the extruder, cooled and shaped.

Description

PROCESS FOR DIRECT PRODUCTION OF GUM BASE FOR CHEWING PASTE AND CHEWING GUM

The present invention relates to chewing pastes (chewing gums) and the gum bases for producing such pastes; it relates to a new process for their preparation and an improved composition of these products.

In the prior art, a chewing paste or chewing gum included a minor proportion of a gum base with additives and a major proportion of substances that gave it a sweet taste, together with aromas; according to this technique, the chewing paste includes no more than about 30 weight percent (generally about 20 weight percent) gum base and additives and no less than about 70 weight percent (generally about 80 weight percent) sweet substances (sugar) or substitutes such as polyalcohols, saccharine or aspartame, and at least one percent aromatic substances to give it a fragrance (mint, fruits and/or spices).

The different ingredients are mixed hot to constitute the gum base, which is purified and then mixed with the sugar products (or their substitutes) and the aromatic substances, and the chewing paste of the chewing gum type, which is packaged in the form of tablets, pellets, etc.

In the state of the art, it is not possible to automatically meter, at ambient temperature, the different materials placed in the mixing apparatus and extruders used for producing chewing gum; one might contemplate performing automatic metering with heating of the different substances to a sufficient temperature (on the order of 150°C or more), but such a temperature elevation would cause degradation of the substances and off flavors as well as

substances producing an interfering flavor in the finished chewing gum.

For these reasons, no continuous gum base or chewing gum production has been conducted heretofore.

Furthermore, the products obtained with the conventional compositions and processes include an elevated percentage of extractable materials, including a high proportion of substances with a sweet taste (certain of these substances being adverse to dental health and having a high caloric value), the percentage of insoluble gum base being relatively low, as indicated above (on the order of 20 percent).

The object of the invention is to remedy the above disadvantages, making it possible to prepare, continuously with automatic metering of the components and at a moderate temperature, ie, without deleterious alteration of the raw materials, a chewing gum containing only a low proportion of extractable materials, these extractable materials also being relatively neutral with regard to their effect on the teeth.

The first object of the invention, with regard to the process, is:

a) a process for continuous production, with metering of the components, a composite nonadhesive gum base, particularly for a chewing paste of the chewing gum type, characterized by the following successive operations:

(i) at least one elastomer and at least one mineral filler are introduced into a mixing apparatus of the industrial mill type including heating means; the mixing apparatus is heated to raise its contents to a temperature ranging from about 80°C to about 100°C, and the mixer contents held at that temperature are mixed for a time

period ranging from about 35 minutes to about 75 minutes;

(ii) the contents of the mixing apparatus are then discharged and then consist of a nonadhesive premix;

(iii) said premix is divided into fragments;

(iv) metered amounts of fragments of said premix and at least one other nonadhesive starting material of the gum base are introduced into a powder mixer, and the contents are mixed for several minutes;

(v) the mixture thus obtained is then evacuated from the mixer;

b) A process for producing a chewing paste of the chewing gum type, characterized by following successive operations:

(i) at least one elastomer and at least one mineral filler is introduced into a mixing apparatus of the industrial mill type including heating means; the mixing apparatus is heated to raise its contents to a temperature ranging from about 80°C to about 100°C, and the mixer contents, held at that temperature, are mixed for a time period ranging from about 35 minutes to about 75 minutes;

(ii) the contents of the mixing apparatus are subsequently discharged and then consist of a nonadhesive premix;

(iii) the fragments of said premix are divided;

(iv) the following are introduced in metered amounts into an extruder with several segments and with means of maintaining each segment at a desired temperature:

- fragments of said premix and at least one other nonadhesive raw material of the gum base,

- at least one plasticizer, and

- at least one flavoring, notably with a sweet taste,

the passage of the fragments of premix and of the other raw material(s) of the gum base in the extruder being accomplished in several minutes, notably 1-5 minutes; and

(v) the product obtained is then removed from the extruder, cooled and shaped.

Preferably the fragment of said premix and of at least one other gum base raw material are preferably mixed in a powder mixer for several minutes prior to being fed into the extruder, the mixture obtained in said mixer being fed to the first segment of the extruder, while the plasticizer(s) is/are introduced into the second segment of the extruder, and the flavoring(s) is/are fed to the third segment of the extruder.

With regard to the chewing paste of the chewing gum type, including a gum base obtained by the above-specified process, the invention also consists of making this paste contain no less than 97% gum base with at least one plasticizer, at least one filler and water, and no more than 3% sweetener and flavorings.

Preferably the gum base contains about 3-30% water and about 2-5% lecithin and/or glycerin as an emulsifier.

Advantageously, the flavoring substances used are nonsugar products such as saccharine or aspartame.

In any case, the invention can be readily understood with the aid of the remaining description in the following and the single attached figure (said remaining description and figure being given, of course, primarily by way of illustration).

The single figure is a highly schematic diagram of a device illustrating the embodiment of the process of the invention for obtaining a chewing paste of the chewing gum type, also in accordance with the invention.

According to the invention, it is proposed to perform a process for preparing and composing chewing pastes of the chewing gum type and gum bases for said pastes in the following manner or a similar manner.

The device in the single figure includes essentially three units, ie, a mixing apparatus A of the industrial mill type, a powder mixer B and an extruder C with three segments C_1, C_2 and C_3, the final operations (D_1 cooling, D_2 shaping and cutting, and D_3 packaging) being included in rectangle D.

The elastomer or elastomers *a* and the mineral fillers *b* are fed to mixer A of the industrial mill type, eg, of the mill type including two mixing blades 1 in Z form.

In particular, the elastomers of the natural type (chicle, jelutong or sorva, which are dried lattices) or synthetic type (isopropylene copolymers called butyl rubber, polyisobutylenes, polyisobutene) and synthetic resins and/or waxes can be used.

With regard to the mineral fillers, they generally consist of talc and/or calcium carbonate, the latter contributing to the neutralization of acid traces that may form on the teeth, thus reducing dental caries.

Mixing apparatus A is provided with a double shell (not illustrated) by means of which its contents can be heated to a temperature on the order of 80-100°C.

When the elastomer or elastomers and the filler or fillers are inside

apparatus A and are maintained at the aforementioned temperature, the Z blades mix these products for a time period ranging from about 35 to 75 min depending on the composition of the mixture.

By way of example, for a mixture consisting of:

butyl rubber 18%

polyisobutylene 19%

talc 63%

and for a temperature of 85°C of the mixture, mixing is performed for 40 min.

The mineral fillers (such as talc and/or carbonate) can be fed in several stages depending on the type of elastomers used, in order to reduce the mechanical heating of the mass contained in the mixing apparatus A; such heating is deleterious to the quality of the finished product.

When the elastomer or elastomers introduced into *a* are adhesive, the premixing in mixing apparatus A is nonadhesive and thus easy to manage. Apparatus A may therefore be easily discharged, even by dumping.

Nonetheless, an endless screw 2 is advantageously provided at the base of mixing apparatus A to facilitate extraction of premix *c* from mixing apparatus A.

At the outlet of endless screw 2, one may provide an impeller breaker E or a similar device which shears premix *c* to produce fragments such as chips or flakes, *d*, of premix, ie, of the mixture of elastomer(s) and mineral filler(s).

These fragments *d* are cooled to about 20°C in an apparatus (not represented), then metered into an apparatus (also not represented).

The cooled, metered fragments *d'* are introduced into the powder mixer B,

which includes, for example, a band 3 that is turned by a shaft 4 inside the mixer.

At least one other raw material *e* of the gum base, such as waxes, resins, polyvinyl acetate and emulsifiers, is also introduced into the mixer.

The mixing of the components *d'* and *e* in mixer B lasts for about 10 min at ambient temperature.

Obtained at the outlet of powder mixer B is a premix *f*, which is fed to a metering apparatus F.

After metering in this apparatus, the unplasticized gum base is introduced into the first segment C_1 of an extruder of the single- or double-screw type.

In the first segment or container C_1 of extruder C, a temperature is maintained on the order of 60-75°C to raise this unplasticized gum base to that temperature.

The output from segment C_1, the premix heated to a temperature of 60-75°C, plus a liquid plasticizer are fed to the second segment or container C_2 of the extruder, which is maintained at a temperature on the order 50°C.

In particular, one may feed, via a pump C_4, a well-defined flow of at least one plasticizer *g* consisting of lecithin and/or glycerin, and via pump C_5, an equally well-defined flow of water *h*; particularly in the event one wishes to produce a chewable gum base, water is fed in a concentration ranging from 1 to 30 weight percent relative to the gum base.

The output of segment C_2 is fed to the third segment or container C_3 of extruder C, that segment being maintained at a temperature of 50-60°C and receiving additionally the most high temperature-sensitive substances such as

the sweeteners, aromas, vitamins or any other active principle.

Illustrated in the figure is a pump C_6 for adding a metered flow of such substances *j* in the liquid state and an assembly C_7 including a hopper and an endless screw for introducing a flow, also metered, of such substances *k* in the powder state.

At the outlet of extruder C, ie, at the outlet of the third segment of the container C_3, the chewing paste *l* is obtained; it is cooled at D_1, shaped and cut at D_2 and packaged, for example, wrapped at D_3, all in a conventional manner. Finally, the finished product, ie, the chewing gum *m*, is obtained at the outlet of assembly D (consisting of cooling units D_1, forming and cutting units D_2 and packaging unit D_3).

As a variant, one could obviate the powder mixer B by feeding not the mixture *f* as illustrated but, separately, the fragments or flakes *d'* of premix and the other raw material(s) *e* of the gum base into the first segment C_1 of extruder C.

With regard to the chewing gum composition, the invention is characterized essentially by the fact that it proposes a chewing gum consisting:

- of at least 97 weight percent gum base including - in addition to the natural and/or synthetic elastomers with optional additives such as microcrystalline waxes, hydrogenated oils, glycerol monostearate, synthetic resins, polyvinyl acetates and the fillers (notably talc and/or calcium carbonate) - lecithin and/or glycerin (notably lecithin in an amount of 2-5 percent) and water (notably in the amount of 5-30 percent); and

- of no more than 3 weight percent sweetener (notably artificial

sweetener having a sweetening power in excess of that of sugar) and natural or artificial fragrance, such a composition being characterized by the compositions of the prior art.

Indeed, it is known that, currently, a chewing gum comprises less than 30 weight percent, generally 20 weight percent of gum base consisting of elastomers (natural and/or synthetic gum) and plasticizing substances (such as waxes, paraffins, vegetable oils), additives such as glycerol monostearate, plasticizer substances and adhesives for conferring the desired texture to the chewing gum, and to this gum base are currently added massive amounts of at least 70 weight percent, generally 80 weight percent sugar (conventional sugar-containing chewing gum) or polyalcohols and synthetic sweeteners (such as saccharine or aspartame) for the more-recent sugarless chewing gums, the latter having the advantage of being less harmful to the teeth in view of the absence of sugar.

In all cases, these prior chewing gums with or without sugar comprise a minor proportion of gum base (less than 30 percent) and a major proportion of sugar or polyalcohols and artificial substances with a high sweetening power.

As a result, a relatively high proportion of the weight of the prior art chewing gum is extractable by the consumer during chewing.

Thus, we see the essential modification proposed by the invention, ie, the production of a chewing gum with a very high proportion (at least 97%) of gum base by including lecithin and/or glycerin and water, and a very low proportion (at the most 3 percent) sweeteners and possibly flavorings.

More precisely, a gum base for a chewing gum in accordance with the invention consists of a mixture of the following substances:

Table I

Natural and/or synthetic elastomers (for example, polyisobutylene and/or butyl)	about 3-11%
Microcrystalline waxes and/or hydrogenated oils	5-20%
Glycerol monostearate	0.5-15%
Semisynthetic resins and/or polyvinyl acetate	10-30%
Fillers (talc and/or calcium carbonate)	20-50%
Lecithin and/or glycerin	2-5%
Antioxidant (BHA for example)	0.05-0.1% (on the order of)
Sodium benzoate	0.1% (on the order of)
Water	5-30%

The presence of sodium benzoate inhibits the development of fungi at water contents in excess of 6%.

To produce the chewing gum, no more than 3 weight percent of synthetic sweeteners with high sweetening power and, optionally, aromas (mint, fruit and/or spice extracts) is added to no less than 97 weight percent of this gum base.

By way of example, a particular chewing gum according to the more general indications above may have the following composition:

Table II

Polyisobutylene	2.55%	5.51%	Talc	40.51%
Butyl	2.96%		BHA	0.05%
Microcrystalline waxes	7.10%	15.45%	Lecithin	4.0%
Soybean oil	8.35%		Water	10.0%
Glycerol monostearate	1.0%			
Semisynthetic resins	13.0%	20.40%	Aromas	2.68%
Polyvinyl acetate	7.40%		Saccharin	0.3%
Sodium benzoate	0.1%		(Total aroma + saccharin 2.98%)	

A comparative study by a group of experts of the texture of chewing gum samples prepared according to the preceding example shows that this chewing paste has characteristics at least equal and in most cases superior to those of the traditional chewing gums, particularly with regard to the initial indentation hardness and the hydration time. The evaluations of the experts are shown in Table III below.

On the other hand, we also verified, as shown in Tables IV and V, that the quantity of substances extracted was very low (less than 2% of the total weight), these substances also being nonmetabolizable (talc, carbonate, aromatic products, sweetener, coloring agent), and the pH of the saliva during chewing had a tendency to maintain a level above 7, which is very favorable for preventing dental plaque formation.

The extracted talc was determined by weight analysis after calcination in an incinerator. The aromas and BHA present in the saliva were quantitatively

Table III

(Texture)

	Initial indentation hardness	Cohesion	Final elasticity	Final adhesion	Hydration time
Sugar-containing CG	6/10	8/10	3/10	3/10	30 sec
Sugarless CG	5/10	7/10	3/10	1/10	25 sec
Invention	1/10	10/10	3/10	2/10	5 sec

CG: prior art chewing gum
Invention: chewing gum according to the above example (Table II)

Table IV. (Salivary extraction).

An analytical study of the saliva produced by seven volunteers after 20 minutes of chewing the gum prepared by the formula of the above-described example gave the following results:

Soybean oil, lecithin, glycerol monostearate, waxes	not detectable
Elastomers	traces
Resins, polyvinyl acetate	not detectable
Talc	1.5%
Aroma	0.2%
BHA	several ppm
Sweetener (saccharin)	0.15%

analyzed by gas chromatography. The oils, waxes and insolubles were quantitatively analyzed by liquid chromatography.

In order to obtain a chewing gum having the composition according to the

Table V. (Saliva pH).

Samples prepared according to the above example after 10 minutes of chewing brought about a pH increase of 1.5 units in the oral cavity (study using 10 volunteers).

	Initial	After 10 minutes	After 20 minutes
Sugar-containing CG	7	7.5	7.5
Sugarless CG	7	7.5	7.5
Invention	7	8	8.5

invention without the risk of thermal degradation producing a bad flavor and an increase in the amount of extractable material, a low temperature must be used in the process.

The chewing gum having the composition of the example (Table II), for which the test results are shown in Tables III, IV and V, was obtained by the process described with reference to the figure and with the apparatus illustrated in the figure.

As a variant, one can prepare a chewing gum having a composition according to the invention by the following process.

One starts with a pre-existent gum base obtained according to a prior art process based on polymer technology.

The gum base is raised to a temperature ranging from 50°C to 70°C either in a microwave oven or in a kiln to render it mixable in an insulated X-blade mill preheated to 50-70°C.

The system is mixed, with lecithin, water at ambient temperature and talc added successively. The temperature at the end of mixing must be in the range

of about 50-60°C.

At this stage, sweeteners, aromatic substances and possibly special substances such as vitamins, minerals, enzymes, drugs, etc, may be added provided suitable precautions are taken with regard to their stability and efficacy.

In order to ensure the greatest possible degree of harmlessness of the packaged chewing gum obtained by the process illustrated with reference to the figure or by the above-cited variant, the chewing gum is coated, particularly when it is in the form of dragees, not with sugar or syrup (as is done conventionally) but with noncariogenic, nonassimilable substances such as gum arabic, calcium carbonate and/or titanium dioxide.

In particular, one may produce dragees by cutting the chewing gum obtained within the scope of the invention into 1-3 g pieces, which are then covered with a layer of calcium carbonate or titanium dioxide, coated with gum arabic, then glazed with gum arabic and talc or with polyvinyl acetate dissolved hot in alcohol. The weight increase of the pieces is on the order of 3-30% nonassimilable substances.

With the invention, it is thus possible to obtain a chewing paste of the chewing gum type that consists almost exclusively of insoluble substances (plasticized gum base), the proportion of soluble substances extractable by the saliva during chewing being quite minimal, and these extractable substances being neutral and harmless to the teeth and without caloric value.

Obviously, and as already stated in the preceding, the invention is by no means limited to those of its modes of application and embodiment that have been specifically contemplated; on the contrary, it embraces all variants:

Claims

1. Process for continuously producing, with metering of the components, a nonadhesive composite gum base specifically for a chewing paste of the chewing gum type, characterized by the following successive operations:

(i) At least one elastomer (*a*) and at least one mineral filler (*b*) are fed into a mixing apparatus (A) of the industrial mill type including heating means; the mixing apparatus is heated to raise its contents to a temperature ranging from about 80°C to about 100°C, and the contents of the mixing apparatus, maintained at said temperature, are mixed for a time period ranging from about 35 minutes to about 75 minutes;

(ii) The contents of the mixing apparatus are subsequently discharged and then consist of a nonadhesive premix (*c*);

(iii) Said premix is divided into fragments;

(iv) Metered amounts of fragments (*d*) of said premix and at least one other starting material (*e*) of the gum base are introduced into a powder mixer (B), and the contents of the mixer are mixed for several minutes;

(v) The mixture (f) thus obtained is discharged from the mixer.

2. Process for producing a chewing paste of the chewing gum type, characterized by the following successive operations:

(i) At least one elastomer (*a*) and at least one mineral filler (*b*) are fed into a mixing apparatus (A) of the industrial mill type including heating means; the mixing apparatus is heated to raise its contents to a temperature ranging from about 80°C to about 100°C,

and the contents of the mixing apparatus, maintained at said temperature, are mixed for a time period ranging from about 35 minutes to about 75 minutes;

(ii) The contents are subsequently discharged from the mixing apparatus and then consists of a nonadhesive premix (*c*);

(iii) Said premix is divided into fragments;

(iv) Metered amounts of the following are successively fed into an extruder (C) having several segments and means of maintaining each segment at a desired temperature:

- fragments (*d*) of said premix and at least one other starting material of the gum base,
- at least one plasticizer (*g*,*h*) and
- at least one flavoring substance (*j*,*k*), notably with a sweet taste,

the passage of the fragments of the premix and of the other starting material(s) of the gum base in the extruder being accomplished within several minutes (notably 1-5 minutes); and

(v) the product obtained is discharged from the extruder, cooled and shaped.

3. Process according to Claim 2, characterized by the fact that the mixing of the fragments of said premix (*d*) and at least one other starting material (*e*) of the gum base is conducted in a powder mixer (B) for several minutes prior to the feeding into the extruder (C), the mixture obtained (*f*) in said mixer being introduced into the first segment (C_1) of the extruder (C), while the plasticizer(s) (*g*,*h*) are introduced into the second segment,

and the flavoring substances (*j*,*k*) are introduced into the third segment (C_3) of the extruder.

4. Process according to Claim 3, characterized by the fact that, in extruder (C) with three successive segments, the first segment (C_1) is maintained at temperature on the order of 60-75°C and receives the unplasticized gum base (*f*) from the powder mixer; the second segment (C_2) is maintained at a temperature on the order of 50°C and receives the output from segment (C_1) and at least one liquid plasticizer (*g*) and at least one solid plasticizer (*h*), and the third segment (C_3) is maintained at a temperature on the order of 50°C-60°C and receives the output from segment (C_2), and the substances (*j*,*k*) that are most sensitive to temperature elevations, such as sweeteners and aromas.

5. Chewing paste of the chewing gum type, characterized by the fact that it comprises a gum base obtained by the process according to any of Claims 1 through 4.

6. Chewing paste according to Claim 5, characterized by the fact that it comprises no less than 97% gum base with at least one plasticizer, at least one filler and water plus no more than 3% sweetener product and flavoring substances.

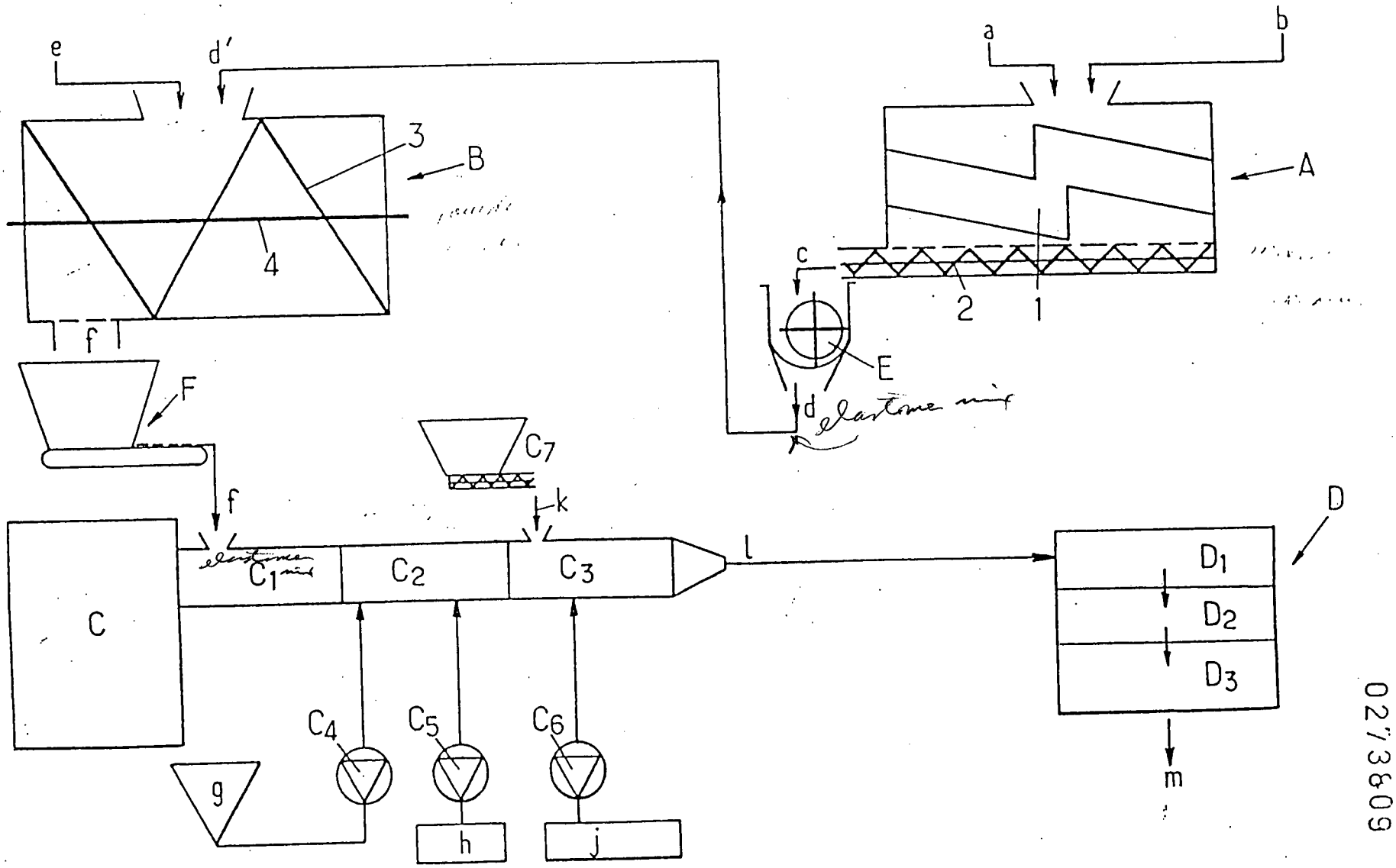
7. Chewing paste according to Claim 6, characterized by the fact that the gum base comprises about 3-30 percent water and about 2-5 percent lecithin and/or glycerin as an emulsifier.

8. Chewing paste according to Claim 6 or 7, characterized by the fact that nonsugar products such as saccharin and aspartame are used as flavoring substances.

9. Chewing paste according to any of Claims 5 through 8, characterized by the fact that it comprises, as a gum base, a product having the following composition:

	about
Natural and/or synthetic elastomers	3-11%
Microcrystalline waxes and/or hydrogenated oils	5-20%
Glycerol monostearate	0.5-15%
Semisynthetic resins and/or polyvinyl acetate	10-30%
Fillers (talc and/or calcium carbonate)	20-50%
Lecithin and/or glycerin	2-5%
Antioxidant	0.05-0.1% (on the order of)
Sodium benzoate	0.1% (on the order of)
Water	5-30%

10. Dragee obtained from the chewing paste according to Claim 9 and characterized by the fact that it comprises a coating of 3-30 percent nonassimilable, noncariogenic substances consisting of talc or calcium carbonate, gum arabic and polyvinyl acetate.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